



# READACRIT Centrifuge

[Model Nos. 0591 and 0592]

AND

# MP READACRIT Centrifuge

[Model Nos. 0593 and 0594]

## OPERATORS MANUAL



**Clay Adams**

Division of  
Becton, Dickinson and Company  
Parsippany, N. J. 07054



**BECTON  
DICKINSON**

# **READACRIT**

## **Centrifuge**

**Model No. 0591 [115 volts]    Model No. 0592 [220 volts]**

**AND**


# **MP READACRIT**

## **Centrifuge**

**Model No. 0593 [115 volts]    Model No. 0594 [220 volts]**

## **OPERATORS MANUAL**

**Read this manual thoroughly before operating equipment.**

**ADAMS, PRE-CAL, READACRIT, MP READACRIT, REDI-LANCE  
SEAL-EASE, SEDI-CAL, SEDI-STAIN, VACUTAINER, Clay Adams,  
and  are trademarks of Becton Dickinson and Company.**

Should the power cord and plug become cracked, frayed, broken or otherwise damaged, they should be replaced immediately by a qualified serviceman.

Unplug the power cord before servicing. The operator should not perform any servicing except as specifically stated in this manual. Refer other servicing to your nearest Clay Adams dealer or call Clay Adams Technical Service Department: (201) 887-4800.

## C. PRINCIPLES OF OPERATION

### 1. Micro-Hematocrit Method

Micro methods for the determination of hematocrits have been widely used in clinical laboratories for many years. The results of micro-hematocrit determinations are recognized as being fully equivalent to the results of macro determinations. The macro method of Wintrobe<sup>(1)</sup> requires at least 1 ml of blood and up to 30 minutes of centrifugation. The more commonly used micro methods utilize approximately 65 cu. mm. (.065 ml) of blood and require only about 5 minutes of centrifugation.

The usual micro technique for determining hematocrit utilizes a small glass capillary tube, internally coated with an anticoagulant (heparin). This capillary tube is filled with blood usually obtained from a finger-puncture. One end of the capillary tube is sealed with plastic clay (Figure 1), and the tube is placed in a special micro-hematocrit centrifuge, where it is rotated at high speed for about 5 minutes. After centrifugation, the blood sample is separated into two fractions (Figure 2), a column of packed red cells and a column of clear plasma.

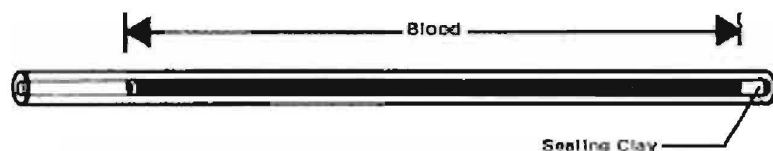


Figure 1. Capillary Tube with Whole Blood, Sealed for Centrifugation.

The hematocrit is defined as the ratio of the volume of packed red cells to the volume of the original blood sample, multiplied by 100. Since the capillary tube is of uniform bore, the hematocrit may be easily determined by measuring the two lengths as shown in Figure 2. The hematocrit value may then be redefined as follows:

$$\text{HEMATOCRIT} = (\text{length of column of packed red cells} \div \text{overall length of blood sample}) \times 100$$

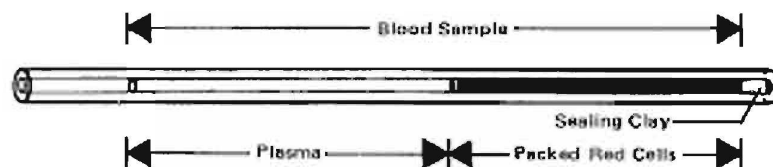


Figure 2. Capillary Tube After Centrifugation.

Usually the two lengths are measured with the aid of special mechanical reading

devices. Such devices present the final hematocrit value without requiring any computation by the operator.

## 2. READACRIT Centrifuge Principle

The READACRIT Centrifuge incorporates a built-in hematocrit scale and tube-holding compartments which, when used with special pre-calibrated capillary tubes, permit the direct-reading of hematocrit by measuring the length of the packed red cell column. It is not necessary to measure the overall length of blood used, since this length remains unchanged from one sample to the next.

The READACRIT Centrifuge is designed to be used with heparinized PRE-CAL Capillary Tubes.\* A PRE-CAL Capillary Tube is 75 mm long and bears a calibration mark 60 mm from one end. The length of the built-in scale in the READACRIT Centrifuge is exactly the same as the length of the calibrated portion of the tube. The volume of blood used is only about 15 cu. mm (0.015 ml).

Figure 3 illustrates the READACRIT Centrifuge MHCT principle, in this case yielding a hematocrit value of 30. A PRE-CAL Tube was first filled with blood to the calibration mark and then centrifuged. As shown in Figure 3, the length of the packed red cell column when measured against the centrifuge scale equals the hematocrit.

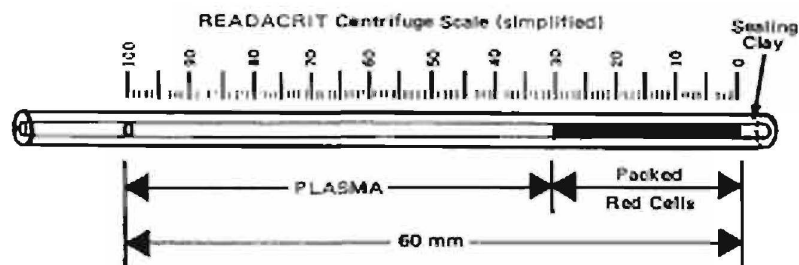


Figure 3. PRE-CAL Capillary Tube (calibration mark not shown) Containing Blood Sample After Centrifugation.

## 3. SEDI-CAL Tube Principle

In healthy individuals, urine usually contains very little sediment. There may be a small number of hyaline casts, epithelial cells, bacterial mucus threads, crystals and some amorphous materials. An occasional leucocyte and erythrocyte may also be seen.<sup>(2)</sup>

In renal parenchymal disease, the urine usually contains increased numbers of cells and casts from an organ which is otherwise accessible only by biopsy or at operation.<sup>(3)</sup>

Microscopic examination of urinary sediment is a semi-quantitative procedure, which, while not intended as a substitute for more exact enumeration techniques such as the Addis Count<sup>(4)</sup>, is a valuable method for determining the state of health of the urinary tract. Elements, which are too few in number to be observed in a specimen prepared for counting, may be observed in the concentrated sediment and may be of great diagnostic or prognostic importance.<sup>(5)</sup>

\*PRE-CAL Capillary Tubes contain 0.5 (minimum) U. S. P. units of ammonium heparin per tube.



The usual sedimentation equipment and the techniques<sup>(6),(7),(8)</sup> permit a considerable range in sediment concentration. The SEDI-CAL Centrifuge Tube (Figure 4) has been designed to standardize the concentration of urine sediment, thereby providing improved reliability in estimating the quantities of various materials present.

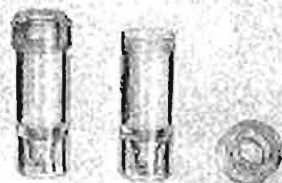


Figure 4. SEDI-CAL Centrifuge Tube/Cap.

The disposable SEDI-CAL Centrifuge Tube provides a rapid means for obtaining reproducible concentrations of urine sediment; sediment can then be studied microscopically, directly on the optical examination plateau of the SEDI-CAL Cap itself. Test tube racks, pipettes and separate microscope slides are not needed.

In using the SEDI-CAL Tube (Figure 5), the tube is first filled with urine to the upper calibration mark, then centrifuged on the MP READACRIT Centrifuge to deposit the sediment in a special reservoir at the bottom of the tube. The supernatant is then poured out, but the reservoir remains full due to atmospheric pressure and surface tension. Since the reservoir retains about 1/20 the volume of the filled tube, the sediment will be repeatedly concentrated into a standard volume of urine.

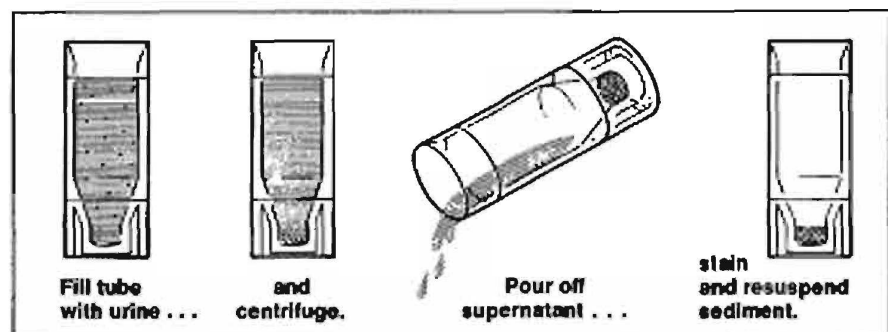


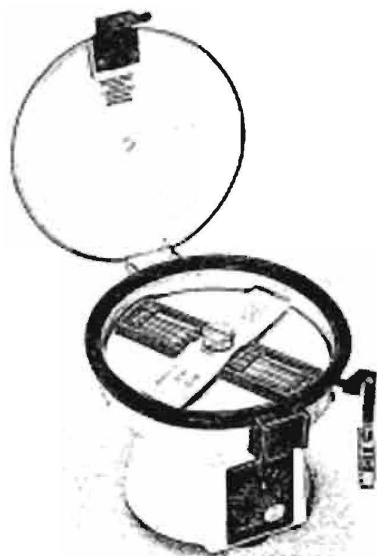
Figure 5. Steps to Standard Urine Sediment Samples Using SEDI-CAL Centrifuge Tube.

## D. PERFORMANCE CHARACTERISTICS AND SPECIFICATIONS

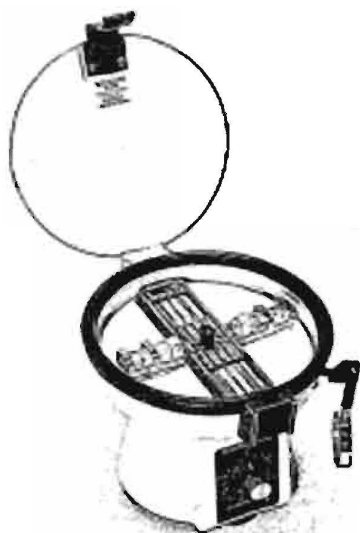
### 1. Description

The READACRIT Centrifuge (Figure 6) and MP READACRIT Centrifuge (Figure 7) stand on a base assembly supported by 3 rubber feet which prevent the instrument from creeping. A timer assembly which operates an ON-OFF switch is mounted on the base assembly. Behind the timer knob is a plate, calibrated in increments up to a 5-minute spinning cycle.

Mounted atop the base is the bowl assembly which contains the rotating centrifuge head. Attached to the head are PRE-CAL Tube compartments with numbered slots for holding up to six PRE-CAL Capillary Tubes. The tubes are secured during centrifugation by the head cover. The head is tilted forward for



*Figure 6. READACRIT Centrifuge for Direct Reading of Micro-Hematocrits.*



*Figure 7. MP READACRIT Centrifuge for Direct Reading of Micro-Hematocrits and for Obtaining Blood Separations, Spinal Fluid Exudate and Transudate Sediments, and Urine Sedimentations.*

convenient reading of the capillary tubes. An adjustable magnifier is provided to aid in reading the hematocrit scale.

At right angles to the PRE-CAL Tube compartment, *on the MP READACRIT Centrifuge only*, are holders for centrifuging two SEDI-CAL Centrifuge Tubes. Hinged, numbered covers on the tube holders secure the SEDI-CAL Tubes during centrifugation.

A clear plastic top cover is hinged to the rear of the bowl assembly. A latch is mounted on the front of the top cover. The latch is locked by pushing it down into the latch block and safety switch assembly on the front of the guard bowl. The motor will not operate unless the cover is securely latched.

## 2. Specifications

### ☐ Speed:

Model Nos. 0591 and 0592	8000 rpm $\pm$ 10%
Model Nos. 0593 and 0594	7000 rpm (minimum), with filled SEDI-CAL Tubes installed.

### ☐ Nominal Relative Centrifugal Force (RCF):

Model Nos. 0591 and 0592	5900 g
Model Nos. 0593 and 0594	4750 g, with filled SEDI-CAL Tubes installed.

### ☐ Hematocrit Time: 5 minutes $\pm$ 30 seconds.

### ☐ Motor: Universal type — all models.

☐ Dimensions and Weights:

Height	7 $\frac{1}{2}$ "
Width	8 $\frac{1}{2}$ "
Depth	9 $\frac{1}{2}$ " (including hinge and front latch block)
Net Weight	7.5 lbs.
Shipping Weight	Model Nos. 0591 and 0592—10.5 lbs. Model Nos. 0593 and 0594—11.5 lbs.

☐ Power Cord—both models:

Equipped with a 6-foot, U.L.-listed power cord with strain-relief and three-prong plug.

☐ Power Requirements:

Model Nos. 0591 and 0593: 115 volts AC, 50–60 Hz, 1.4 Amps

Model Nos. 0592 and 0594: 220 volts AC, 50 Hz, 0.7 Amps

## E. OPERATING INSTRUCTIONS

Connect the READACRIT Centrifuge to a 3-wire grounded AC receptacle rated for the particular model.

**CAUTION:**

Connect only to a 3-wire grounded receptacle. Where only a 2-wire receptacle is available, replace with a properly grounded 3-wire receptacle. Do not remove grounding prong from power plug of Centrifuge. If an extension cord is required, use only a 3-wire (grounded) extension cord rated at 15 amps.

### 1. Centrifuging PRE-CAL Tubes

#### a. Opening Top Cover

Pull the bottom of flexible plastic latch out, as shown in Figure 8, until the cover snaps open.

#### b. Unlocking Head Cover

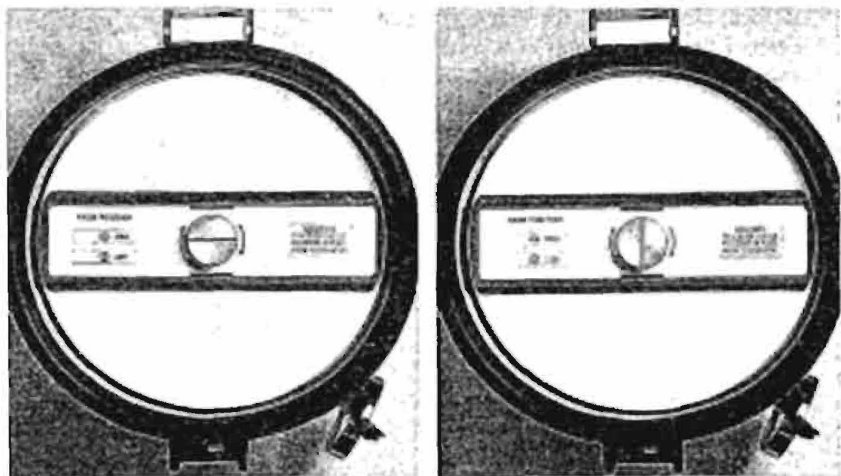
Unlock the head cover by rotating the head cover knob a quarter-turn clockwise, as directed on the cover (Figure 9). Remove head cover from head.



Figure 8. Opening Cover Latch

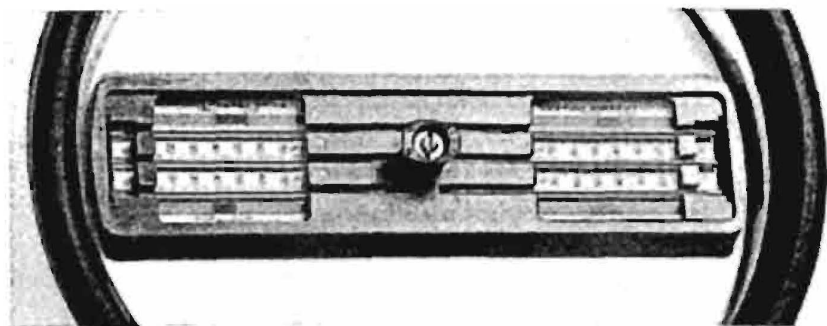
#### c. Placing PRE-CAL Tubes in Head

Place the blood-filled PRE-CAL Capillary Tubes in the numbered slots of the PRE-CAL Tube Compartment with the sealed ends near the outer edge of the head (zero end of printed scale). Slide the tubes so that the sealed ends press against the black rubber gasket (Figure 10). Six tubes, 3 per compartment, can be centrifuged simultaneously. *Care should be taken to record the number of*



*Figure 9. READACRIT Centrifuge With Head Cover Unlocked (left) and Locked (right).*

the slot used for each patient's blood specimen. When loading more than 1, but less than 5 tubes, balance the head by loading the opposite numbered slots (i.e., load no. 1, 4, 2, 5 in this sequence).



*Figure 10. Placement of Blood-Filled PRE-CAL Tubes in READACRIT Centrifuge.*

**NOTE:** Failure to balance the head in this manner may cause a slight increase in noise if all slots on one side of the centrifuge are empty. However, this imbalance will not affect operation of the centrifuge or accuracy of the determination.

**d. Locking Head Cover**

When the PRE-CAL Tubes are in position, replace the head cover. Make certain that the cover is completely within the compartment recess. Lock the head cover securely by turning the head cover knob a quarter-turn clockwise, as directed on the cover (see Figure 9). **CAUTION: DO NOT OPERATE THE CENTRIFUGE UNLESS THE HEAD COVER HAS BEEN LOCKED IN PLACE.**

e. Closing Top Cover

Before closing the top cover, make certain that the magnifier is out of the way in the down position. Close the cover. Lock the cover latch by pushing down until it snaps into place in the latch block (Figure 11). The safety switch, engaged by this action will permit operation of the motor.



Figure 11. Locking Cover Latch.

f. Starting Centrifuge Motor

Rotate the timer knob *clockwise* to the stop. This action will start the motor which will reach full speed almost instantly. The motor will continue to operate for 5 minutes before stopping automatically.

To operate for more than 5 minutes: Recycle the centrifuge by turning the timer knob.

To operate for less than 5 minutes: The timer is provided with calibrations at 1, 2 and 5 minutes. The motor will operate if the knob is set at any intermediate position between 0 and 5, provided the top cover is closed and the latch is engaged. The knob must first be turned clockwise far enough so that a click is heard; it may then be reset back, if required. To stop the centrifuge before the reset cycle has been completed, merely turn the knob back to zero.

**CAUTION:**  
**DO NOT OPEN TOP COVER OF CENTRIFUGE UNTIL SPINNING**  
**HEAD HAS STOPPED.**

Once the head has stopped completely, release latch, open top cover, and unlock head cover by rotating knob *clockwise* a quarter-turn. The PRE-CAL Tubes may now be read.

## 2. Centrifuging SEDI-CAL Tubes

Centrifugation of SEDI-CAL Centrifuge Tubes can only be performed with the MP READACRIT Centrifuge.

**NOTE:**

The READACRIT Centrifuge can be converted to accept SEDI-CAL Tubes by using a Clay Adams Conversion Kit, Catalog No. 0599.

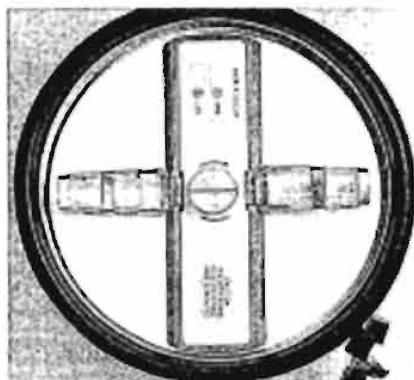
Open the top cover of the centrifuge, as described previously and proceed as follows:

- a. Lift one of the two hinged covers on the SEDI-CAL Tube Holder. Place the SEDI-CAL Tube in the holder with its cap toward the center, as shown in Figure 12.
- b. Balance the first SEDI-CAL Tube with a second tube filled to within 1/4-inch of the same height, placed in opposite holder. NEVER ATTEMPT TO CENTRIFUGE JUST ONE SEDI-CAL TUBE. If the first SEDI-CAL Tube has been filled to within 1/8-inch of the calibration mark, the Special Balance

Tube may be used in the other holder. The balance tube, shown in Figure 12, eliminates the need for filling a second SEDI-CAL Tube when only one sample is to be centrifuged.

**NOTE: EXCESSIVE MACHINE NOISE OR VIBRATION USUALLY MEANS THAT THE TUBES ARE NOT PROPERLY BALANCED.**

- c. Be sure SEDI-CAL Tubes are placed with caps toward center locking knob.
- d. Close both hinged holder covers.
- e. Close top cover of MP READACRIT Centrifuge in accordance with previous instructions.



*Figure 12. MP READACRIT Centrifuge with Filled SEDI-CAL Tube (left) and Balance Tube (right).*

### 3. Use of MP READACRIT Centrifuge for Simultaneous Determinations

The PRE-CAL Tube compartment and the SEDI-CAL Tube holder of the MP READACRIT Centrifuge can be used simultaneously. Follow the directions given for each procedure, with the exception that centrifugation time is additive. For example, if the centrifuge is loaded with urine-filled SEDI-CAL Tubes and PRE-CAL Capillary Tubes, centrifuge the SEDI-CAL Tubes for 1 minute and remove; centrifuge capillary tubes an additional 4 minutes, for a total of 5 minutes.

## F. CALIBRATION PROCEDURES

READACRIT Centrifuges are fixed-speed devices. The speeds may be measured with any accurate tachometer, such as an ADAMS Photo Electric Tachometer, Model 5205. Mechanical tachometers that contact the rotor are to be avoided. If the machine speed is found to be outside specified limits (see Performance and Specifications, above), then the supply voltage should be checked with an accurate monitor. The speeds are specified only for 115 volts, 60 Hz for Model Nos. 0591 and 0593, and 220 volts, 50 Hz for Model Nos. 0592 and 0594. Deviations in either line voltage or frequency will affect operating speed. If speeds are outside specified limits, contact your nearest franchised Clay Adams equipment dealer for service, or contact Clay Adams Technical Service Department: (201) 887-4800.

## G. OPERATING PRECAUTIONS

### 1. Basic Precautions

In order to obtain properly centrifuged specimens, as well as to prevent damage to READACRIT Centrifuges, the following basic operating precautions should be carefully observed:

- ☐ **Electrical:** Operate the Centrifuge only from an AC power source rated for the particular centrifuge.

- ☐ **Load Balancing:** For smooth operation and long service life of the READACRIT Centrifuges, it is important that loads be balanced as equally as possible. Equally important to balancing is the even distribution of material to be centrifuged. Follow the distribution instructions included in this Manual.
- ☐ **Installing Head Cover:** Always install the head cover before operating the centrifuge.
- ☐ **Timing:** For accurate results, follow the recommended timing routines specified in this Manual.
- ☐ **MHCT Readings:** Accurate micro-hematocrit determinations depend upon proper blood collection and handling techniques. Carefully observe the procedures described in this Manual.
- ☐ **Cleanliness:** Keep centrifuge clean and dust-free in accordance with Maintenance and Service Instructions supplied in this Manual. Avoid spilling liquids into the centrifuge bowl.

## 2. Operator Training

READACRIT Centrifuges are electrical instruments designed to produce quantitative micro-hematocrit determinations for medical purposes. The use of this instrument for patient medical evaluation places a responsibility upon administrative personnel for adequate training of operators in the safe and effective use of the equipment.

Administrative personnel should make certain that all operators and technicians receive adequate training before being allowed to operate the centrifuges. Such training should include a thorough working knowledge of:

- ☐ Centrifuge Set-up and Power Requirements,
- ☐ Handling and Preparation of Blood Samples,
- ☐ Reading of Micro-hematocrit Values,
- ☐ Urine Sedimentation Techniques, and
- ☐ Equipment Service and Maintenance.

## H. HAZARDS

Basic safety precautions should be observed when operating Centrifuges in order to avoid the hazards of electrical shock or other physical injury.

READACRIT Centrifuges are not to be used in Class 1, Division 1, Group C hazardous locations, defined by the National Fire Protection Association, Bulletin No. 56A (Inhalation Anesthetics), as extending upward to a level of 5 feet above the floor where flammable anesthetics are used.

### To Avoid Electrical Shock:

- ☐ Plug the power cord only into a grounded 3-wire receptacle.
- ☐ Never remove the grounding prong from the power plug.
- ☐ Always unplug the power cord before attempting to service the centrifuge.
- ☐ Immediately replace worn or damaged power cord or plug.

### To Avoid Physical Injury:

- ☐ Never, under any condition, open the lid of the centrifuge while the rotor is spinning.

## 1. SERVICE AND MAINTENANCE

Care has been taken to assure that every component of the READACRIT Centrifuge delivers long, trouble-free service. Instruments are fully guaranteed against defects in workmanship and materials for a period of one year, provided they have not been subjected to abuse or misuse.

Service and maintenance that can be performed by operating personnel are described below. Refer all other service and repairs to your nearest franchised Clay Adams equipment dealer, or contact Clay Adams Technical Service Department: (201) 887-4800.

### 1. Lubrication

Both models of the READACRIT Centrifuge have pre-lubricated sleeve-type bearings which require no lubrication during the lifetime of the machine.

### 2. Tube Compartment Gaskets

After prolonged use, the gaskets in the PRE-CAL Tube Compartments in the centrifuge head may become punctured and worn. Replace them, as shown in Figure 13, with the extra set of gaskets supplied with the centrifuge. Additional gaskets may be ordered under Clay Adams Catalog No. 0591-617-000.

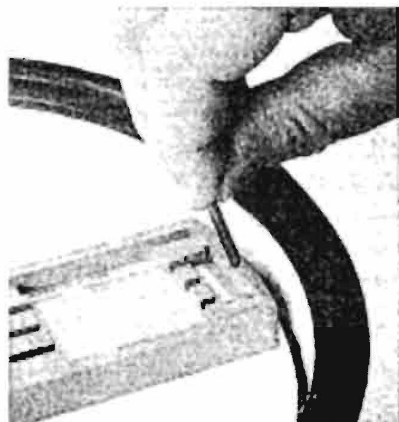


Figure 13. Replacing Worn Tube Gasket.

### 3. Brushes, Motor, Timer and Safety Switch

Occasionally, it will be necessary to disassemble the READACRIT Centrifuge in order to inspect or replace internal parts. Detailed disassembly procedures are contained in Appendix B of this Manual.

#### CAUTION:

**DISCONNECT POWER CORD FROM WALL RECEPTACLE BEFORE DISASSEMBLING THE READACRIT CENTRIFUGE.**

- a. **Brushes:** Brushes should be inspected after 2500 operating cycles, equivalent to about 1 year of use where the centrifuge has been operated on an average of 10 times per day. If overall length of the brushes is less than 1/4-inch (including the round shoulder), they should be replaced. See Appendix A, and be sure to order the correct Clay Adams replacement Motor Brush Kit. To inspect the brushes, the motor must be removed in accordance with the disassembly instructions contained in Appendix B.



- h. Motor, Timer and Safety Switch:** Should any of these assemblies become defective, replace them with the following Clay Adams parts:

Motor (115 volts):	Catalog No. 0591-600-000
Motor (220 volts):	Catalog No. 0592-600-000
Timer with knob:	Catalog No. 0592-601-000
Safety Switch:	Catalog No. 0591-602-101

#### **4. Cleaning**

It is recommended that interior and exterior surfaces of the centrifuge bowl, head, head cover and lid be wiped occasionally with a damp cloth. A mild detergent may be used to remove stains. Keeping these parts clean will prolong the life of the centrifuge.

The transparent cover of the centrifuge is made of a shatter-proof polycarbonate resin, resistant to a wide range of laboratory chemicals. It is recommended, however, that the cover be kept clean and that spillage be wiped off as soon as possible. A mild detergent should be used. Do not use carbon tetrachloride, chloroform, gasoline or acetone. Other chemicals, such as aromatic hydrocarbons, (benzene, toluene, xylene) and strong alkalies, (sodium and ammonium hydroxide) can damage the cover.

#### **5. Transporting Centrifuge**

Though the READACRIT Centrifuge can withstand the rigors of normal laboratory use, it can be damaged by dropping or by excessive abuse in handling. If the centrifuge must be shipped, package it carefully in a strong, shock-proof container to prevent damage from vibration and impact.

#### **6. Spare Parts and Accessories**

Spare Parts and Accessories for the READACRIT Centrifuges can be obtained through your nearest Clay Adams equipment dealer. Spare part numbers are listed in Appendix A.

### **III. SPECIMEN COLLECTION AND PREPARATION**

#### **A. FOR MICRO-HEMATOCRIT DETERMINATIONS**

Procedures for filling and handling PRE-CAL Tubes with patient blood samples taken from finger punctures or from venipunctures are described below:

##### **1. Finger Puncture Blood**

##### **a. Filling PRE-CAL Tube:**

- (1). Puncture the fingertip with a RED-LANCE Blood Lancet or equivalent disposable lancet.
- (2). Grasp the end of a PRE-CAL Tube nearest the calibration mark, between the thumb and forefinger. Do not obscure calibration mark.
- (3). Insert the end farthest from the calibration mark into the center of the drop of blood on the finger. NOTE: THE FINGERTIP SHOULD NEVER BE TIGHTLY SQUEEZED TO INCREASE BLOOD FLOW. Squeezing the finger will dilute the blood specimen with tissue fluid and cause a falsely low hematocrit reading. Hold the tube level (in a horizontal position) and observe the blood level as it approaches the calibration mark.

(4). FILL THE TUBE EXACTLY TO THE CALIBRATION MARK. The rate of filling may be accelerated by tilting the end near the calibration mark below horizontal. The rate may be retarded, stopped or reversed by tilting the same end above horizontal. (Figure 14).

(5). When blood reaches the calibration mark, remove the tube from the finger, holding it level so that blood cannot flow out the end.

NOTE: In the event the tube has been accidentally filled beyond the calibration mark, remove the excess blood by gently dabbing the wet tip with a cotton or gauze sponge.

(6). Tilt the tube until blood flows about 1/8" in from the blood collecting tip (Figure 15). Then return tube to a horizontal position so that no blood is lost.

(7). Wipe any blood from the outside of the tube with a lint-free tissue.

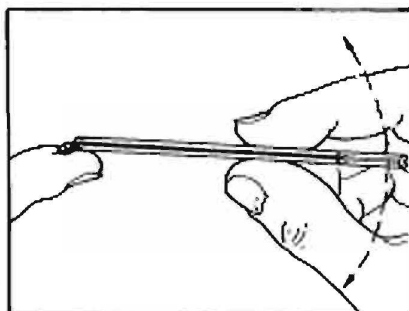


Figure 14. Tilt PRE-CAL tube to Regulate Blood Flow.

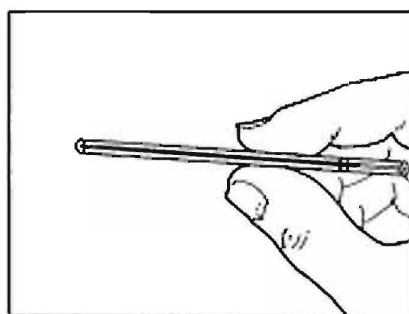


Figure 15. Remove Blood from Collecting Tip.

b. Sealing PRE-CAL Tube:

Invert the tube so that the blood-free end nearest the calibration mark is directed downward. Immediately insert blood-free end into the SEAL-EASE Tube Holder as shown in Figure 16. Push the tube fully into the clay before blood flows to the clean end. The tube is now ready for centrifugation.

NOTE: If blood reaches the end of the tube before SEAL-EASE Tube Sealer is forced in, some blood may be lost and the clay will not seal.

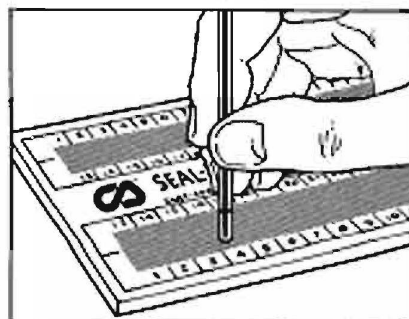


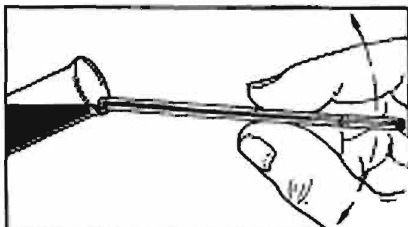
Figure 16. Insert Blood-Free End into SEAL-EASE Tube Holder.

2. Venipuncture Blood

Blood from venipunctures can be collected with either a standard syringe or a VACUTAINER Brand Blood Collection Tube. To prepare venous blood for a hematocrit determination, proceed as follows:

- a. After collecting the patient specimen, mix the blood thoroughly by inverting the VACUTAINER Blood Collection Tube or syringe several times. Remove the VACUTAINER Blood Collection Tube needle and adapter. If using a syringe, transfer specimen to a clean test tube. Immediately fill PRE-CAL Tube as described below.

- b. Grasp the end of the PRE-CAL Tube nearest the calibration mark between the thumb and forefinger. Do not obscure the calibration mark.
- c. Tilt the VACUTAINER Blood Collection Tube or test tube to a near horizontal position so that blood flows toward the mouth of the tube. Dip the end of PRE-CAL Tube farthest from the calibration mark into the blood sample. Hold the PRE-CAL Tube in a horizontal position and observe the blood level as it approaches the calibration mark.
- d. **THE TUBE MUST BE FILLED EXACTLY TO THE CALIBRATION MARK.** The rate of filling may be accelerated by tilting the end near the calibration mark below the horizontal. When tilting, be careful not to spill blood from the VACUTAINER Brand Blood Collection Tube. The rate may be retarded, stopped or reversed by tilting the same end above the horizontal as shown in Figure 17.



*Figure 17. Keep PRE-CAL Tube Nearly Horizontal While Filling From VACUTAINER Brand Blood Collection Tube.*

- e. When the blood reaches the calibration mark, remove the PRE-CAL Tube, holding it level so that blood cannot flow out the end.
- f. Follow same directions for sealing PRE-CAL Tube as described above.

### 3. Interfering Substances

#### a. Anticoagulants:

It has been reported that the hematocrit value of blood anticoagulated with oxalates is 8% to 13% less than that obtained when using heparin.<sup>(9),(10)</sup> It is also reported that reliable hematocrit values cannot be obtained when the concentration of disodium ethylenediaminetetraacetate (EDTA) anticoagulant exceeds 2 mg per ml of whole blood.<sup>(11)</sup>

#### b. Drugs:

It has been observed that certain drugs will cause variations in hematocrit levels due to physiological factors. Consult Reference (10) for additional information.

### 4. Storing PRE-CAL Tubes Prior to Centrifugation

The PRE-CAL Tube is heparinized to prevent blood clotting. It can, therefore, be stored in the SEAL-EASE Tube Holder for up to 2½ hours prior to centrifugation.

## B. FOR URINE SEDIMENTATION EXAMINATIONS

Urine specimens should be freshly voided samples, collected in clean containers. The container should be capped immediately and its contents processed as soon as possible after collection. For routine microscopic examination, unless the specimen is known to be contaminated by vaginal discharge or hemorrhage, there is no need for elaborate cleansing procedures.

Specimens which cannot be examined immediately should be refrigerated, but must not be frozen. If examination is to be delayed beyond 4 hours, it is recommended that one (1) drop of 40% formalin per 30 ml of urine be added to prevent growth of micro-organisms and to preserve urinary sediments.<sup>(12)</sup>

Chloroform should not be used as a preservative, since it settles to the bottom of the container and may interfere with the microscopic examination.

Caution should be exercised in selecting preservatives which will not interfere with other tests to which the specimen may be subjected.

## IV. TEST PROCEDURES

### A. MICRO-HEMATOCRIT DETERMINATIONS—

With READACRIT and MP READACRIT Centrifuges

#### 1. Timing and Centrifuging

Place the properly filled PRE-CAL Tubes in the centrifuge compartments in accordance with previous instructions.

Set the timer for five (5) minutes and centrifuge capillary tubes.

#### 2. Reading the Hematocrit

##### a. Positioning Head and Magnifier:

Move the magnifier to its active position.

Rotate the head so that the PRE-CAL Tube to be read is directly under the magnifier (Figure 18).

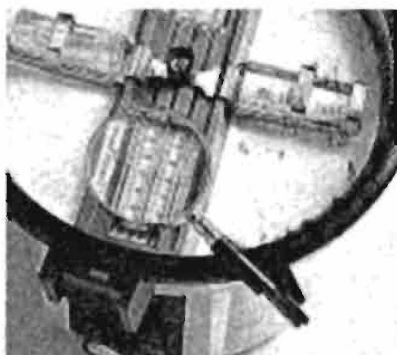


Figure 18. Head and Magnifier Properly Positioned for Viewing the PRE-CAL Tube.

##### b. Setting to the Zero Mark:

Shift the PRE-CAL Tube in its slot so that the interface between SEAL-EASE Clay and packed red cell column is exactly aligned with the "0" mark on the centrifuge hematocrit scale.

##### c. Reading a Hematocrit:

Read the mark on the printed scale adjacent to the interface between the plasma and the packed red cells. This value is the hematocrit. Discard PRE-CAL Tubes after reading.

### B. URINE SEDIMENTATION EXAMINATIONS—

With MP READACRIT Centrifuge

In order to prepare urine specimens for microscopic examination, start with:

- |  |   |
|--|---|
| <input type="checkbox"/> Patient sample: freshly voided urine                          | <input type="checkbox"/> Microscope   |
| <input type="checkbox"/> SEDI-CAL Centrifuge Tubes and Caps                            | <input type="checkbox"/> Cover slips, 3/4-inch square                                   |
| <input type="checkbox"/> Clay Adams MP READACRIT Centrifuge (Model Nos. 0593 or 0594*) | <input type="checkbox"/> SEDI-STAIN Concentrated Stain (Catalog No. 1570) or equivalent |
|  | <input type="checkbox"/> Lens Tissue  |

\*NOTE: The READACRIT Centrifuge can be converted to an MP READACRIT Centrifuge for urine sedimentation by the use of a Catalog No. 0599 Conversion Kit.

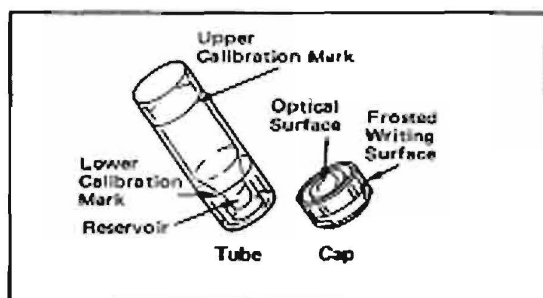


Figure 19. SEDI-CAL Tube and Cap.

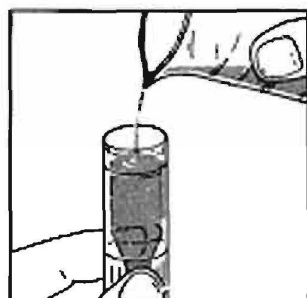


Figure 20. Filling SEDI-CAL Tube to Upper Calibration Mark

### 1. Filling the SEDI-CAL Tube (Figure 19)

- Thoroughly mix the fresh urine specimen and pour into the SEDI-CAL Tube to the upper calibration mark as shown in Figure 20. If the SEDI-CAL Tube is filled exactly to this calibration mark; it will contain 4 ml of urine and the concentration of the sediment sample for examination will be approximately 20X. If less specimen is used, the concentration will also be less.
- Mark patient identification on the cap using a marking crayon or a felt tip pen with permanent ink. The circumference of the cap has a *Frosted Writing Surface* for this purpose.
- Wipe lint off the optical surface of the cap with lens tissue.
- Place the cap on the tube.

### 2. Centrifuging SEDI-CAL Tubes

- Place SEDI-CAL Tubes in MP READACRIT Centrifuge in accordance with previous operating instructions. NOTE: Be sure tubes are placed with caps toward center of locking knob.
- Balance the first SEDI-CAL Tube with a second tube filled to within 1/4-inch of the upper calibration mark. Never attempt to centrifuge just one SEDI-CAL Tube without first balancing the centrifuge.

If a SEDI-CAL Tube has been filled to within 1/8-inch of the upper calibration mark, the special Balance Tube may be used in the other holder of the centrifuge. A Balance Tube eliminates the need for filling a second SEDI-CAL Tube when only one urine specimen is to be centrifuged (see Figure 12).

- Set centrifuge timer for one (1) minute and centrifuge according to previous operating instructions.
- After centrifugation, remove the SEDI-CAL Tube by grasping the cap and lifting the tube out of the holder. Grasp the body of the tube as soon as it is clear. NOTE: Do not carry the SEDI-CAL Tube by its cap.

### 3. Preparing Sediment for Microscopic Examination

- a. Uncap the SEDI-CAL Tube and decant supernatant by RAPIDLY and COMPLETELY inverting tube (Figure 21). DO NOT SHAKE. Approximately 0.2 ml of supernatant and sediment should remain in the bottom reservoir. Then IMMEDIATELY turn the tube right side up and replace cap.

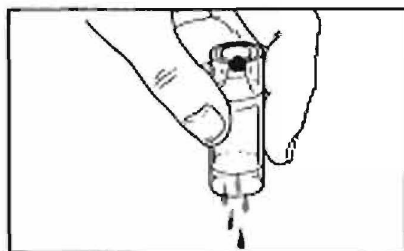


Figure 21. Decanting Supernatant.

- b. Immediately before microscopic examination remove cap and add 1 drop of SEDI-STAIN Concentrated Stain\* or equivalent, for differentiation of formed elements in the sediment. Staining the sediment also aids in differentiating formed elements from abrasions on the optical surface of the SEDI-CAL Cap.
- c. Recap. Place index finger on cap and thumb on bottom of tube. SHAKE VIGOROUSLY 4 to 6 times to insure thorough mixing. Terminate shaking with tube in an upright position (Figure 22). As an alternate procedure, flick bottom of tube with fingernail or against edge of table to obtain thorough mixing. PROCEED TO STEP (d) WITHOUT DELAY.

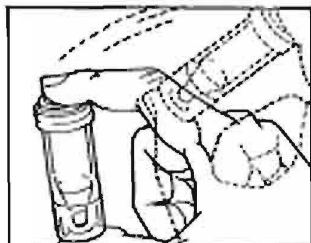


Figure 22. Mixing Stain and Sediment.

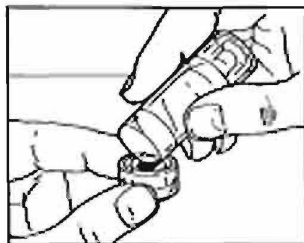


Figure 23. Depositing Sediment on Cap.

- d. Remove cap and hold it on table with one hand. Holding tube at an angle above the cap, strike the edge of the tube sharply against the near side of the plateau in the cap (Figure 23). This will release the suspended sediment from the reservoir and will deposit a drop for examination on the optical surface of the cap. The excess will drain into the surrounding well.
- e. Fit the cap into the 2-place microscope adapter (Clay Adams 0593-621-000). Place a cover slip (¾" square) over the drop and examine the drop under a microscope (Figure 24). Remember to focus for the greater height of the specimen above the stage and to adjust the substage condenser so that light is focused on the cap.



Figure 24. Examining Sediment with Cap in Microscope Adapter and Cover Slip On.

To examine another sample of the same specimen, remove cover slip, replace the tube in the cap, and repeat Steps (c), (d) and (e).

\*SEDI-STAIN Concentrated Stain for Urinary Sediment, Clay Adams Catalog No. 1570 (12.5 ml size), Catalog No. 1571 (60 ml size).

- f. **FOR DEPOSITING SEDIMENT ON STANDARD MICRO SLIDES.** Decant supernatant and stain sediment as described in Steps (a) and (b) above. Recap and shake by placing thumb on cap and index finger on bottom of the tube (Figure 25). ALWAYS END WITH THE TUBE HELD UPSIDE DOWN so that the sediment is collected in the cap. Remove tube from cap (Figure 26), and tap the cap gently against the slide until sufficient material has been deposited (Figure 27). Enough material should remain in the cap to allow the preparation of several microscope slides in this manner, if desired. The use of a cover slip is not essential when specimens are examined on standard micro slides.

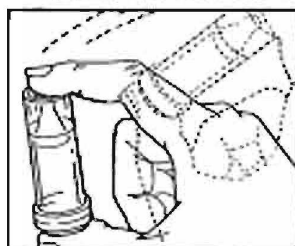


Figure 25. Mixing Stain and Sediment.

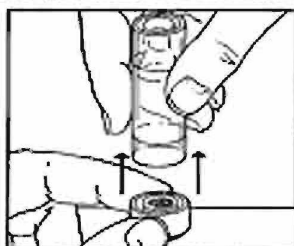


Figure 26. Removing Cap and Stained Sediment.

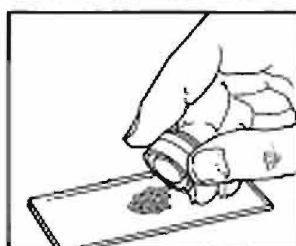


Figure 27. Depositing Sediment on Standard Micro Slide.

- g. Record the average number of red blood cells and white blood cells per high power field. Record the average number of casts and other formed elements per low power field, as examined under a dimmed light.

NOTE: Conventional techniques may also be used in the preparation of urine sediment for microscopic examination.

## C. OTHER CLINICAL LABORATORY PROCEDURES

### 1. Chemical Examinations of Urine

Rapid chemical determinations can be made on urine samples in SEDI-CAL Tubes prior to centrifugation by use of various impregnated "dip sticks". For longer combination strips, simply insert into the SEDI-CAL Tube as far as possible, and touch the face of the strip to the side of the tube. Capillary action will then cause the urine to wet the entire sensitized surface of the strip. For long plastic-backed strips, tilt the SEDI-CAL Tube slightly and bend the strip until the sensitized surface is immersed. Remove strip and touch face of strip to the side of the tube to remove excess urine.

### 2. Preparation of Blood Plasma for Chemical Analysis

- Fill a SEDI-CAL Tube with anticoagulated blood to the upper calibration mark. Cap tube.
- Centrifuge in the MP READACRIT Centrifuge for five (5) minutes following previous Operating Instructions. Be sure centrifuge is properly balanced.
- IMMEDIATELY after centrifugation, GENTLY remove the SEDI-CAL Tube from the MP READACRIT Centrifuge, upper end first, in order to prevent re-suspension of the packed red cells.
- Let the SEDI-CAL Tube stand in an upright position for 15–30 seconds to allow the cells to settle.

- e. Remove cap and withdraw required amount of plasma with pipette or syringe. *About 1.75 ml of clear plasma can be obtained in this manner.*

### 3. Preparation of Blood Plasma for Prothrombin Time Determinations

- a. Fill a SEDI-CAL Tube to the upper calibration mark with oxalated (anticoagulated) blood and proceed to Step (d). If the collected blood has *not* been treated with an anticoagulant, proceed as follows:

NOTE: In the above procedure, blood must be mixed with anticoagulant immediately after collection, and centrifugation must take place within 30 minutes of collection.

- b. Fill the SEDI-CAL Tube to the *lower calibration mark* with 0.1 M sodium oxalate solution (anticoagulant). Use a dropping pipette to insure accurate filling.
- c. Now fill the SEDI-CAL Tube with whole blood to the upper calibration mark. This mixture will provide a dilution ratio of 9 parts blood to 1 part anticoagulant. Use a dropper pipette or hypodermic syringe to insure accurate filling.
- d. Cap the SEDI-CAL Tube and invert gently several times to mix thoroughly.
- e. Obtain plasma as in "Preparation of Plasma for Chemical Analysis", above.

NOTE: In individuals with normal hematocrits, this procedure will yield about 1.75 ml of plasma. If two blood samples are being centrifuged at the same time, be sure to remove both SEDI-CAL Tubes immediately after centrifugation and to keep them in an upright position until the plasma is withdrawn.

### 4. Other Micro Techniques

READACRIT Centrifuges can be used for other micro-techniques requiring centrifugation of capillary tubes. Heparinized capillary tubes, 75 mm, red tipped, are available as Catalog No. 1020. Non-heparinized capillary tubes, 75 mm, blue tipped, are available as Catalog No. 1021.

## V. TEST RESULTS AND LIMITATIONS

### A. MICRO-HEMATOCRIT DETERMINATIONS

Scales within the PRE-CAL Tube compartments of READACRIT Centrifuges provide a direct quantitative reading of hematocrit. Additional computations are not required.

Micro methods for the determination of hematocrits have been widely used in laboratories for many years. The results of micro-hematocrit determinations are recognized as being fully equivalent to the results of macro determinations.

### B. URINE SEDIMENTATION EXAMINATIONS

Microscopic examination of urinary sediment is a semi-quantitative procedure. In cases where exact counts of leucocytes, bacteria, casts, etc., are required, techniques employing a hemacytometer are preferred.<sup>(7)</sup>



## VI. EXPECTED VALUES

### A. NORMAL HEMATOCRIT VALUES

Ranges of normal hematocrit values for adult males and females are indicated by the green areas printed on the centrifuge reader scale (see Figure 10). The normal range for males is 40 to 54 and for females, 37 to 47.<sup>(13)</sup>

In Figure 10, the values 5–12 and 81–100 are obscured by the tube compartment housing in the centrifuge head. These values, however, are rarely found in clinical practice.

### B. URINE SEDIMENTATION VALUES

Some erythrocytes, leucocytes and casts are excreted by normal individuals, but they are seen only occasionally in urinary sediments examined microscopically.

Two to three red blood cells, 4–5 leucocytes per high power field and occasional hyaline casts are expected in normal patient samples.<sup>(3)</sup>

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APPENDIX A  
ILLUSTRATED PARTS BREAKDOWN,  
SPARES and ACCESSORIES  
For  
READACRIT and MP READACRIT Centrifuges

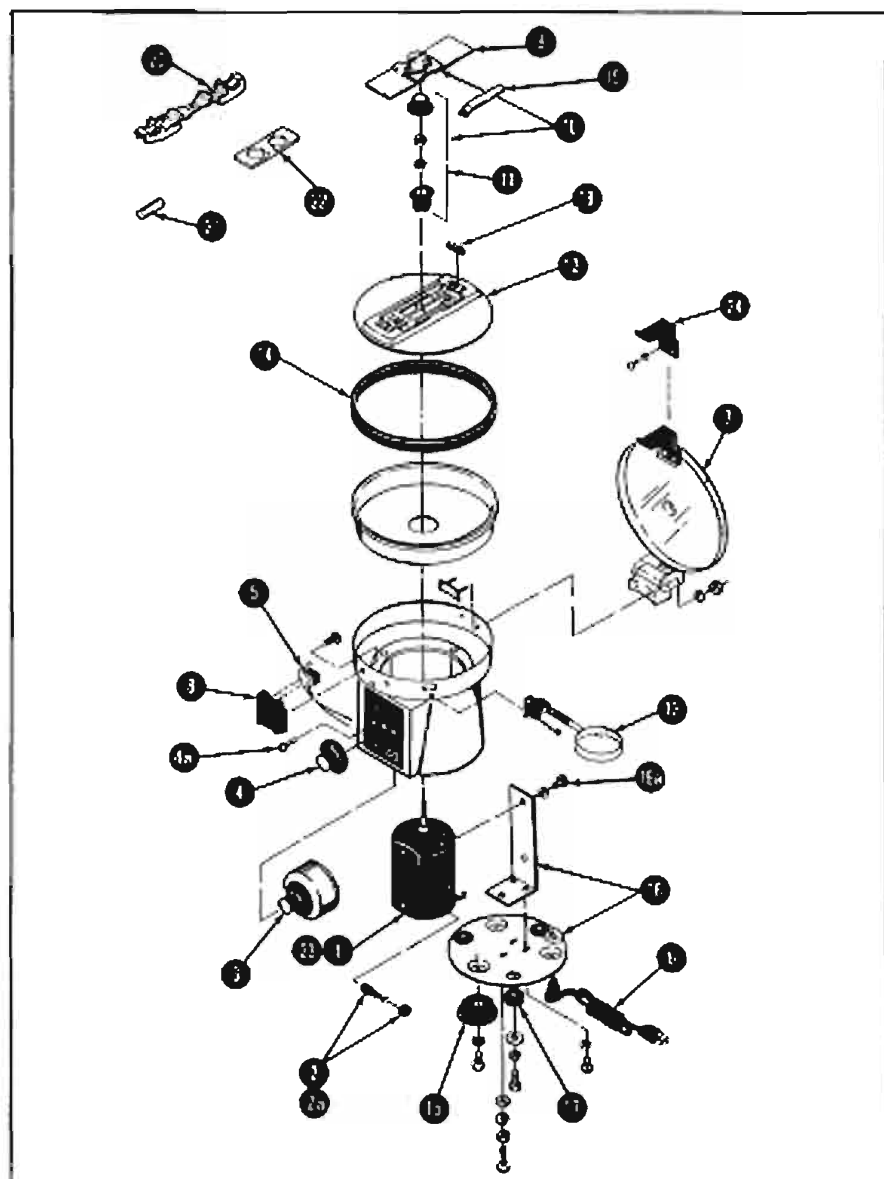


Figure 28. Illustrated Parts Breakdown,  
READACRIT and MP READACRIT Centrifuges.

## APPENDIX B

### READACRIT Centrifuge REPAIR PROCEDURES

The inspection of motor brushes and replacement of these and other parts require disassembly of the READACRIT Centrifuge. Disassemble the machine following the instructions below.

#### WARNING

Always disconnect power cord from wall receptacle before attempting to disassemble the centrifuge. All service should be performed only by trained and authorized personnel.

#### Step 1. Disassembly Procedure

- a. Disconnect power cord from electrical outlet.
- b. Unlock and remove Head Cover.
- c. Insert the tip of a screwdriver into one of the slots of the lock nut on the motor shaft. Hold the screwdriver firmly with one hand to keep the nut from moving, and rotate the head assembly clockwise with the other hand. This will loosen the lock nut. Once the nut has been loosened, unscrew it from the motor shaft. If difficulty is encountered, use the special wrench (Catalog No. 0591-618-000) designed to aid in removal of the lock nut.
- d. Remove the Head Cover Locking Stud from the motor shaft. Lift up the SEDI-CAL Tube holder (on MP READACRIT Centrifuges only) and remove it from the motor shaft.
- e. Insert the tip of a small screwdriver into the slot on the top of the motor shaft. Hold the screwdriver firmly and simultaneously rotate the head counterclockwise until it comes off the shaft. If difficulty is encountered proceed to step (f).
- f. Close and lock the machine cover.
- g. Place machine upside down on the table.
- h. Using a nut driver, remove the 3 screws and washers from the rubber shock mounts on the bottom plate.
- i. Slowly return the machine to its normal operating position. The motor is mounted to the bottom plate which will drop out of the housing. If difficulty is encountered, firm vertical shaking will cause the motor to drop out.

**Step 5. Replacing Safety Switch (Continued)**

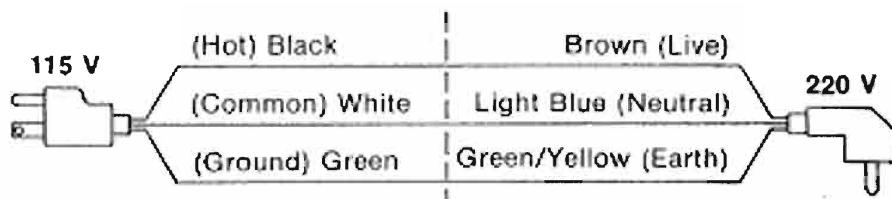
- e. Re-assemble the new Safety Switch in Latch Block.
- f. Re-assemble machine by reversing above disassembly procedures.



## IMPORTANT INSTRUCTIONS 220V LINE CORD

This Centrifuge is equipped with a CEE-Approved Type 220V Line Cord and Plug, which is wired as indicated.

### LINE CORD PLUG/WIRE COLORS



Replacement Parts are available as follows:

MODEL NO.	CENTRIFUGE	REPLACEMENT PART
0206-001-000	TRIAC Centrifuge	0206-606-000
0106-001-000	DYNAC II Centrifuge	0106-608-000
0592-300-000	READACRIT Centrifuge	0592-618-000
0594-100-000	MP READACRIT Centrifuge	0592-618-000
0562-001-000	MHCT II Centrifuge	0562-620-000
0568-001-000	AUTO CRIT II Centrifuge	0562-620-000

**Insert in Manual for Future Reference on Replacement Parts**

**Clay Adams**   
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**Laboratory Instrumentation**

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